REMARKS/ARGUMENTS

Reconsideration of the present application, as presently amended, is respectfully requested.

The specification on pages 4-6, 13 and 14 has been amended to correct various typographical errors, including errors in reference numerals, grammar and syntax. The first paragraph on page 1 has been amended to address the Examiner's concerns about the relationship of the present application to other applications.

With respect to the claims, claim "33b" has been canceled and added as new claim 97. The Examiner's concerns about claims 85 and 89-91 were also addressed by corrections to those claims.

Furthermore, of previously pending claims 1-94, claims 38-51, 55-76, 89 and 93 were allowed; claims 1-4, 7-31, 34-37, 52-54, 77-88, 90-92 and 94 were rejected; and claims 5, 6, 32 and 33 were objected to but were considered allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. In response to these objections and rejections, and to the Examiner's concerns, the applicants have amended claims 1-4, 7, 9, 15, 23, 24, 27, 37, 38, 52-57, 77-83, 85, 87-91; canceled claims 25, 33b, 61, 63-65; and added new claims 95-98.

Specifically, claims 2-4, 7, 9, 15-25, 27-37, 52-54 and 77-86 were rejected under 35 U.S.C. §112, second paragraph, for indefiniteness. The semicolon improperly ending claims 2-4 have been canceled and the objected to language in claim 4 has been amended. Claim 7 has been amended to describe the mirror's relationship to other elements. The problematical term, "said polarizing beam splitter," in claim 9 has been corrected. Claim 15 has been amended to better claim the "waveguide structure," and with the amendment, the problems of claims 16-22 should be removed. Claim 23 has been amended to address the problem of the antecedent basis of "the polarizing beam splitter." Claim 24 was amended to describe the relationship of the claimed electro-optic phase modulator to other elements of the claim, and claim 25 has been canceled to avoid duplication of claim 24. In claim 27 the location of the offending period was corrected,

besides additional amendments to the claim. The applicants amended claim 37 as suggested by the Examiner and to describe their invention in further detail. Claims 38 and 52-54 were amended to better describe the claimed polarization rotator. Finally, claims 77-83 were amended as suggested by the Examiner.

Substantively, claims 1, 8-22, 26-31, 34-36, 87, 88, 90-92, and 94 were rejected under 35 U.S.C. §103(a) for obviousness over an article by I. Brener *et al.*, "Polarization-insensitive parametric wavelength converter based on cascaded nonlinearities in $LiNbO_3$ waveguides," 2000 Optical Fibre Communication Conference, Paper TuF1, Baltimore MD, March 2000, pages 66-68. The Examiner stated:

> "Brener et al discloses a polarization-insensitive wavelength converter fabricated in lithium niobate. Although the details of fabrication are not set forth, it appears that the device is an integrated structure. The Brener et al wavelength converter includes....Figure 1 of Brener et al does not explicitly show a polarization rotator as part of the device, but the use of polarization rotators is described in the first paragraph below Figure 2 on page 67. There, Brener et al states that polarization rotators were employed to provide for different combinations of polarizations to be measured. Since there are plural waveguide paths through the PPLN wavelength converting portion, it follows that a polarization rotator (as discussed by Brener el al) would have been placed between one of the outputs of the polarization separator (PBS) and one of the inputs of the PPLN wavelength converting portion. This is the same polarization rotator arrangement set forth in applicant's claims. The claimed subject matter, therefore, would have been entirely obvious to a person of ordinary skill in the art (at the time of applicants' invention) in view of the Brener et al reference. Note that Brener et al states that the polarization rotators are 'fiber polarization rotators.' The most commonly known and used fiber polarization rotators are fibers having a 90° twist to change the polarization mode...."

The applicants respectfully disagree with this rejection of the claims. For the sake of brevity, the applicants make their arguments with respect to the independent claims which

were rejected for obviousness, i.e., claims 1, 27, 88, 90, 91, and 94. For the convenience of the Examiner, claim 1 as amended, reads:

> "1. A polarization-insensitive integrated wavelength converter comprising:
>
> a wavelength converter having first and second input/output ports on opposite sides of an optical path through said wavelength converter;
>
> a polarization separator having a first port for receiving an input optical signal, a second port providing a first component of the input optical signal in a first polarization mode, and a third port providing a second component of the input optical signal in a second polarization mode, with the second port of the polarization separator optically coupled to the first input/output port of the wavelength converter; and
>
> a polarization rotator coupling the third port of the polarization separator to the second input/output port of the wavelength converter that rotates the polarization mode of an optical signal propagating through the polarization rotator."

The Examiner has argued that a polarization rotator (in the form of an optical fiber twisted 90°) should be placed between one of the outputs of the PBS and one of the inputs of the PPLN waveguide converter shown in Fig. 1 of the Brener article. The other output of the PBS is coupled to the other input of the PPLN waveguide converter without polarization rotation. Without arguing the point, the applicants point out that claim 1 calls for the first and second input/output ports of the wavelength converter to be "on opposite sides of an optical path through said wavelength converter," and the claimed polarization rotator couples "the third port of the polarization separator to the second input/output port of the wavelength converter." The two inputs of the Brener *et al.* device have both inputs on the same side of the PPLN waveguide converter and cannot meet the language of claim 1. Hence claim 1 is not obvious over the cited reference and should be allowable.

Independent claim 27 likewise is also patentably distinguishable over the Brener article. Amended claim 27 reads:

> " 27. A polarization-insensitive integrated wavelength converter comprising:
>
> a substrate;
>
> a polarization separator serving to separate an input optical signal into first and second signal components having orthogonal polarization modes;
>
> a polarization rotator having a portion in said substrate serving to rotate the polarization mode of at least one of said first and second signal components;
>
> a wavelength converter structure in said substrate for receiving said signal components and generating converted signal components; and
>
> waveguides in said substrate carrying first and second signal components to couple said polarization separator and said polarization rotator to said wavelength converter structure."

The polarization rotator, wavelength converter structure and waveguides "carrying first and second signal components to couple said polarization separator and said polarization rotator to said wavelength converter structure" are recited as being in a substrate. The Brener article discloses no such waveguides; in fact, the use of optical fibers for polarization rotators would seem to imply the use of optical fibers in place of substrate waveguides. Hence claim 27 is not obvious over the Brener article and should be allowed.

Amended independent claim 88 calls for an integrated wavelength converter and reads:

> "88. A polarization-insensitive integrated wavelength converter comprising:
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> a polarization separator having two or more waveguides that support orthogonal polarization modes of an input signal, said waveguides formed in a substrate;

a wavelength converting structure formed in the substrate, said wavelength converting structure serving to provide wavelength conversion on said input optical signal; and

a polarization rotator formed in the substrate, said polarization rotator serving to rotate the polarization of the said input signal."

Here the claimed wavelength converting structure, the polarization separator and the polarization rotator are formed in a substrate and, as pointed out above, the polarization separator in the Brener *et al.* device is considered to be a bulk polarizing beam splitter and the polarization rotator is considered to be an optical fiber. Even with the Examiner's arguments, the cited reference does not render the applicants' invention as recited in claim 88 obvious. Claim 88 should be allowed.

Independent claim 90 is also distinguishable from the cited Brener article. Claim 90 recites:

"90. A polarization-insensitive integrated wavelength converter comprising:

at least one polarization separator comprising a first waveguide that supports an input signal having a plurality <u>of</u> polarizations, and a second waveguide that supports at least one polarization mode of said input signal**[[,]]**;

a wavelength converting structure serving to provide wavelength conversion on at least one polarization mode of said input optical signal**[[,]]**; and

a polarization rotator, serving to rotate the polarizations of said input signal in at least one of first or second waveguides.

The claim calls for the polarization separator to be comprised of first and second waveguides. As shown in Fig. 1 of the Brener article, a polarization beam splitter (PBS) separates the polarization modes of incoming signals. Hence claim 90 is patentably distinguishable over the cited reference.

Independent claim 91 recites:

"91. A polarization-insensitive integrated wavelength converter comprising:

at least one polarization separator comprising a first waveguide that supports an input signal having a plurality of polarizations, and a second waveguide that supports one polarization mode of said input signal;

a wavelength converting structure, serving to provide wavelength conversion on at least one polarization mode of said input optical signal; and

a lens, wave plate and reflector assembly serving to optically couple said first and second waveguides."

Thus not only is claim 91 distinguishable over the Brener article by the claimed polarization separator, as pointed out immediately above, but the claimed "lens, wave plate and reflector assembly" further differentiate the applicants' invention over the cited reference.

Finally, independent claim 94 should also be allowable over the Brener article in that it recites:

"94. A polarization-insensitive integrated wavelength converter comprising:

a substrate;

a waveguide, formed in said substrate, capable of supporting both TM and TE polarization modes and having first and second input/output ports;

a polarization rotator region disposed at the second input/output port;

a reflector coupled to said polarization rotator region; and

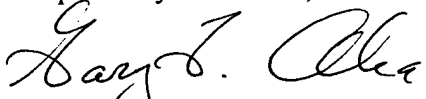
a wavelength converter region formed in the waveguide."

The claimed integrated wavelength converter has a waveguide which supports both TM and TE polarization modes and which is formed in a substrate with a wavelength converter region and is coupled to a polarization rotator at the second input/output port, and thence to a reflector. None of these elements are described in the cited reference.

Hence none of the independent claims 1, 27, 88, 90, 91, and 94 are obvious over the cited Brener reference and should all be allowed. Claims 8-22 and 26 dependent upon claim 1; and claims 28-31, 34-36 dependent upon claim 27; claim 92 upon claim 91; and new claim 98 upon claim 88 should all be allowable at least for being dependent upon allowable base claims.

Therefore, for the foregoing reasons, the applicants believe all the pending claims 1-24, 26-60, 62, and 66-98 are in condition for allowance and should be passed to issue. If the Examiner feels that a telephone conference would in any way expedite the prosecution of the application, please do not hesitate to call the undersigned at (408) 446-7687.

Respectfully submitted,



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